Curriculum Vitae
David Borthwick
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Education

1988	A.B. in Physics, Princeton University
1993	Ph.D. in Physics, Harvard University, advised by Arthur Jaffe

Academic Career

1993–96	Assistant Professor of Mathematics, University of Michigan
1996–97	NSF Postdoctoral Research Fellow, University of California, Berkeley
1997–2002	Assistant Professor of Mathematics, Emory University
2002–09	Associate Professor of Mathematics, Emory University
2009–	Professor of Mathematics, Emory University

Grants and Fellowships

1994	Rackham Faculty Fellowship, University of Michigan
1994–99	NSF Research Grant, Modern Analysis
1996–2000	NSF Postdoctoral Fellowship
2002–06	NSF Research Grant, Geometric Analysis
2009–13	NSF Research Grant, Analysis

Courses Taught at Emory

Mathematics (undergraduate):

111	Calculus I	F1998
112	Calculus II	F1999
211	Advanced Calculus	F2005, S2006, F2006, F2010
250	Foundations of Math	F2000, F2002
275	Honors Linear Algebra (developed)	F2015, F2017
276	Honors Vector Calculus (developed)	S2016, S2018
344	Differential Geometry	F2000, S2003, S2006, S2010, S2012, S2017, S2021
351	Partial Differential equations	S2007
361	Probability and Statistics I	F2001, F2002, F2004, F2006, F2008 F2013, F2014
362	Probability and Statistics II	S2002, S2003, S2005, S2007, S2009
411	Analysis I	F2007, F2012, F2019, F2021
412	Analysis II	S2008, S2013, S2020, S2022
488	Transformation Geometry	S1998

Mathematics (graduate):

511	Complex Analysis	F1997, F1999, F2001, F2003, F2005, F2007, F2009, F2011, F2013, F2014, F2016, F2018, F2020, F2022
512	Real Analysis	S1998, S2000, S2002, S2004, S2005, S2008, S2010, S2012, S2014, S2015, S2017, S2019, S2021
545	Differential Geometry	S2000, F2004, F2010, S2016
547	Differential Topology	F2008
550	Functional Analysis	F1999, F2012, S2020, F2021
789	Analytic Number Theory	S2019, S2022

Undergraduate Students

2002–03	Joey Friesenhahn, Senior Honors Thesis
2006–07	Tristan Dennan, Senior Honors Thesis
2006–07	Sam Ballas, Senior Honors Thesis
2008–09	Jacob Geerlings, Senior Honors Thesis
2009–10	Sara Lykken, Senior Honors Thesis (coadvisor)
2012–13	Xinhui (Philip) Wu, Senior Honors Thesis
2013–14	Junying He, Senior Honors Thesis
2018–19	Varoon Pazhyanur, Senior Honors Thesis
2020–21	Tianlang (Louie) Luo, Senior Honors Thesis

2021–22   Jack Li, Senior Honors Thesis

Graduate Students

2001–02   Jeremy Hall, MS student
2008–12   Catherine Crompton, PhD student
2009–14   Pascal Philipp, PhD student
2018–22   Kenny Jones, PhD student
2019–   Haozhe Yu, PhD student

Service

1997–2014 Departmental Undergraduate Committee
1997–2014 Undergraduate major advisor
1997–98   Departmental Calculus Committee
1998–2001 College Academic Standards Committee
1999   Goldwater Scholarship Committee
2001–   University Library Policy Committee
2002–05   College Curriculum Committee
2003–04   Undergraduate Math Club co-organizer
2002–15   Departmental Library Liaison
2004   Honor Council Panel member
2008   College Curriculum Committee (substitute for Spring semester)
2009–12   University Research Committee, Chair of Math and Natural Sciences sub-committee
2014–15   Co-Director of Graduate Studies
2017–20   College Academic Standards Committee
2015–   Director of Graduate Studies, Mathematics Program

Selected Invited Talks

1995   Differential Geometry Seminar, Indiana University
1996   AMS National Meeting: Special Session, Orlando
1996   AMS-SIAM Summer Conference on Quantization, Mt. Holyoke College
1997   AMS National Meeting Special Session, San Diego

1997	Analysis Seminar, Stanford University
1997	Seminar on Microlocal Methods in Geometric Analysis, Fields Institute, Toronto
1998	AMS Regional Meeting: Special Session, Louisville
1998	Analysis Seminar, University of Georgia
1998	Workshop on Mathematical Physics, UNAM Institute, Cuernavaca, Mexico
1998	Workshop on Spectral Geometry, Schrödinger Institute, Vienna
1998	Mathematical Physics Seminar, Georgia Tech
1999	Workshop on Generalized Dirac Operators, Banach Center, Warsaw
2000	Seminar on Spectral Geometry, University of Kentucky
2001	Differential Geometry Seminar, Indiana University
2002	Workshop on Inverse Spectral Geometry, University of Kentucky
2003	Conference on Spectral Analysis in Geometry and Physics, University of California, San Diego
2003	PDE and Numerical Methods Seminar, Penn State University
2003	Workshop on Spectral Geometry, Dartmouth College
2004	Analysis and Geometry Seminar, Ohio State University
2004	Workshop on Semi-classical Theory of Eigenfunctions and PDEs, CRM, Montreal and Fields Institute, Toronto
2005	AMS National Meeting Special Session, Atlanta
2006	AMS Regional Meeting: Special Session, Fayetteville
2006	AMS Regional Meeting: Special Session, Miami
2007	Workshop on Toeplitz Operators and Deformation Quantization, CTQM, Aarhus, Denmark
2008	AMS National Meeting Special Session, San Diego
2008	Analysis and PDE Seminar, University of Kentucky
2008	Program in Analysis on Singular Spaces, Mathematical Sciences Research Institute, Berkeley
2008	Workshop on Mathematical Theory of Resonances, Banff International Research Station
2009	Workshop on Resonances in Mathematical Physics, Centre International des Rencontres Mathematiques, Luminy
2009	AMS Regional Meeting: Special Session, Pennsylvania State
2010	Workshop on Geometric Scattering Theory and Applications, Banff International Research Station
2010	International Conference on Spectral Geometry, Dartmouth College

2010	Conference on Topics in Spectral and Scattering Theory, Pennsylvania State
2011	Global Analysis Seminar, Temple University
2011	Conference on Spectral gap in dynamical systems, number theory and PDEs, Peyresq, France
2011	Analysis Seminar, McGill University
2011	Workshop on Microlocal Methods in Spectral and Scattering Theory, Northwestern
2011	Analysis Seminar, University of North Carolina, Chapel Hill
2012	Departmental Colloquium, University of North Texas
2012	Undergraduate Mathematics Research Colloquium, University of North Texas
2012	Workshop on Spectral Invariants on Non-compact and Singular Spaces, CRM, Montreal
2012	Colloquium, University of Illinois, Urbana-Champain
2013	Mathematical Physics Seminar, Georgia Tech
2013	Southeast Geometry Seminar, University of Alabama
2013	Conference on Quantum Chaos, Resonances, and Semi-classical Measures, Roscoff, France
2013	Conference on Geometric and Spectral Analysis, Temple University
2014	Conference on Geometric Scattering Theory, Banff International Research Station
2015	Conference on Analysis and Geometry of Resonances, CIRM Luminy, France
2016	QMATH13: Mathematical Results in Quantum Physics, Georgia Institute of Teachnology, Atlanta
2017	Conference on Resonances: Geometric Scattering and Dynamics, CIRM Luminy, France
2017	AMS Regional Meeting: Special Session, Indiana University
2017	Analysis Seminar, University of Missouri, Columbia
2017	Spectral and Scattering Theory Seminar, Purdue University
2018	Mathematical Physics and Harmonic Analysis Seminar, Texas A&M University
2018	Summer School: Spectral Theory of Schrödinger Operators, Friedrich-Schiller Universität, Jena, Germany
2019	Microlocal Analysis and Applications, Fudan University, Shanghai, China
2021	Summer Course, Séminaire de Mathématique Supérieures 2021, CRM Montreal (virtual)
2022	Summer School: Heat Kernels and Spectral Geometry, Bregenz, Austria

Publications

1. D. Borthwick, The Pfaffian line bundle, *Comm. Math. Phys.* **149** (1992), 463–494.

2. —, Euclidean Majorana fermions, fermionic integrals, and relative Pfaffians, *J. Math. Phys.* **34** (1993), 2691–2712.

3. —, A. Lesniewski, and H. Upmeier, Non-perturbative deformation quantization of Cartan domains, *J. Funct. Anal.* **113** (1993), 153–176.

4. —, S. Klimek, A. Lesniewski, and M. Rinaldi, Super Toeplitz operators and non-perturbative deformation quantization of supermanifolds, *Comm. Math. Phys.* **153** (1993), 49–76.

5. —, A. Lesniewski, and M. Rinaldi, Hermitian symmetric superspaces of type IV, *J. Math. Phys.* **34** (1993), 4817–4833.

6. —, S. Klimek, A. Lesniewski, and M. Rinaldi, Supersymmetry and Fredholm modules over quantized spaces, *Comm. Math. Phys.* **166** (1994), 397–415.

7. —, S. Klimek, A. Lesniewski, and M. Rinaldi, Matrix Cartan superdomains, super Toeplitz operators, and quantization, *J. Funct. Anal.* **127** (1995), 456–510.

8. —, M. Rinaldi, and A. Lesniewski, Notes on the structure of quantized hermitian symmetric spaces, *Rev. Math. Phys.* **7** (1995) 871–891.

9. —, T. Paul, and A. Uribe, Legendrian distributions with applications to relative Poincaré series, *Inventiones Math.* **122** (1995) 359–402.

10. — and A. Uribe, Almost complex structures and geometric quantization, *Math. Res. Lett.* **3** (1996), 845–861.

11. —, A. McRae, and E. C. Taylor, Quasirigidity of hyperbolic 3-manifolds and scattering theory, *Duke Math. J.* **89** (1997), 225–236.

12. —, Microlocal techniques for semiclassical problems in geometric quantization, in *Perspectives on Quantization*, ed. by M.A. Rieffel and L.A. Coburn, *Contemp. Math.* **214** (1998).

13. —, T. Paul, and A. Uribe, Semiclassical spectral estimates for Toeplitz operators, *Ann. Inst. Fourier* **48** (1998), 1189–1229.

14. — and A. Uribe, Nearly Kählerian embeddings of symplectic manifolds, *Asian J. Math.* **4** (2000), 599–620.

15. —, Introduction to Kähler quantization, *Contemp. Math.* **260** (2000), 91–132.

16. —, Scattering theory for conformally compact metrics with variable curvature at infinity, *J. Funct. Anal.* **184** (2001), 313–376.

17. — and P. Perry, Scattering poles for asymptotically hyperbolic manifolds, *Trans. Amer. Math. Soc.* **354** (2002), 1215-1231.

18. — and A. Uribe, The spectral density function for the Laplacian on high tensor powers of a line bundle, *Ann. Global Anal. Geom.* **21** (2002), 269–286.

19. —, C. Judge, and P. Perry, Determinants of Laplacians and isopolar metrics on surfaces of infinite area, *Duke Math. J.* **118** (2003), 61–102.

20. — and A. Uribe, On the pseudospectra of Berezin-Toeplitz operators, *Methods Appl. Anal.* **10** (2003), 31–65.

21. —, C. Judge, and P. Perry, Selberg's zeta function and the spectral geometry of geometrically finite hyperbolic surfaces, *Comm. Math. Helv.* **80** (2005), 483–515.

22. — and S. Graffi, A local quantum version of the Kolmogorov theorem, *Comm. Math. Phys.* **257** (2005), 499–514.

23. — and A. Uribe, The semi-classical structure of low-energy states in the presence of a magnetic field, *Trans. Amer. Math. Soc.* **359** (2007), 1875–1888.

24. —, *Spectral Theory of Infinite-Area Hyperbolic Surfaces*, Progress in Mathematics **256**, Birkhäuser, Boston, 2007.

25. —, Upper and lower bounds on resonances for manifolds hyperbolic near infinity, *Comm. Partial Diff. Eq.* **33** (2008), 1507–1539.

26. —, Sharp upper bounds on resonances for perturbations of hyperbolic space, *Asymptotic Anal.* **69** (2010), 45–85.

27. — and P. Perry, Inverse scattering results for metrics hyperbolic near infinity, *J. Geom. Anal.* **21** (2011), 305–333

28. —, T. Christiansen, P. Hislop, and P. Perry, Resonances for manifolds hyperbolic at infinity: optimal lower bounds on order of growth, *Int. Math. Res. Not. IMRN* **2011** (2011), 4431–4470.

29. — and S. Garibaldi, Did a 1-dimensional magnet detect a 248-dimensional Lie algebra?, *Notices Amer. Math. Soc.* **58** (2011), 1055–1066.

30. —, Sharp geometric upper bounds on resonances for surfaces with hyperbolic ends, *Anal. PDE* **5** (2012), 513–552.

31. —, Introduction to spectral theory on hyperbolic surfaces, *Proc. Symp. Pure Math.* **84** (2012), 3–48.

32. —, Distribution of resonances for hyperbolic surfaces, *Exp. Math.* **23** (2014), 25–45.

33. — and P. Philipp, Resonance asymptotics for asymptotically hyperbolic manifolds with warped-product ends, *Asymptotic Anal.* **90** (2014), 45–85.

34. — and C. Crompton, Resonance asymptotics for Schrödinger operators on hyperbolic space, *J. Spectral Theory* **4** (2014), 515–567.

35. — and J. Marzuola, Dispersive estimates for scalar and matrix Schrödinger operators on $\mathbb{H}^{n+1}$, *Math. Phys. Anal. Geom.* **18** (2015), Art. 22.

36. — and C. Guillarmou, Upper bounds for the number of resonances on geometrically finite hyperbolic manifolds, *J. Eur. Math. Soc.* **18** (2016), 997–1041.

37. — and T. Weich, Symmetry reduction of holomorphic iterated function schemes and factorization of Selberg zeta functions, *J. Spectral Theory* **6** (2016), 267–329.

38. S. Dyatlov, Improved fractal weyl bounds, Appendix by D. Borthwick, S. Dyatlov, and T. Weich, *J. Eur. Math. Soc.* **21** (2019), 1595–1639.

39. —, *Spectral Theory of Infinite-Area Hyperbolic Surfaces* (2nd ed.), Progress in Mathematics **318**, Birkhäuser, Boston, 2016.

40. —, *Introduction to Partial Differential Equations*, Universitext, Springer, 2016.

41. —, R. Donninger, E. Lenzmann, J. L. Marzuola, Existence and stability of Schrödinger solitons on noncompact manifolds, *SIAM J. Math. Anal.* **51** (2018), 3854–3901.

42. —, *Spectral Theory: Basic Concepts and Applications*, Graduate Texts in Mathematics, **284**, Springer, 2020.

43. —, L. Corsi, and K. Jones, Sharp diameter bound on the spectral gap for quantum graphs, *Proc. Amer. Math. Soc.* **149** (2021), 2879–2890.

44. — and Y. Wang, Existence of resonances for Schrödinger operators on hyperbolic space, preprint (2022), to appear in *Anal. PDE*.

45. —, E. M. Harrell II, and K. Jones, The heat kernel on the diagonal for a compact metric graph, preprint (2022), to appear in *Ann. Henri Poincaré*.